SWEDISH ECONOMIC POLICY REVIEW 5 (1998) 303-343

Anatomy of policy complementarities

Mike Orszag* and Dennis J. Snower**

Summary

■ The analysis provides a new explanation for two widespread problems concerning European unemployment policy: the disappointingly small effect of many past reform measures on unemployment and the political difficulties in implementing more extensive reform programmes. We argue that the heart of these problems may be the failure of many European governments to implement broad-based reform strategies. Our analysis suggests that major unemployment policies are characterised by *economic complementarities* (in the sense that the effectiveness of one policy depends on the implementation of other policies) and *political complementarities* (in that the ability to gain political consent for one policy depends on the acceptance of other policies). Under these circumstances, incremental, small-scale adjustments of existing policy packages are doomed to failure. Our analysis suggests instead that the European unemployment problem should be tackled through broad reforms that exploit the salient economic and political complementarities among individual policy measures. ■

* *Lecturer in Economics at Birkbeck College, University of London. His research focus is on welfare state reform issues, including pensions, disability and unemployment.*

** *Professor of Economics at Birkbeck College, University of London, and co-director of CEPR's Public Policy Programme. His research focuses on macroeconomic theory and policy, explanations of unemployment and wage setting, and welfare state reform.*

SWEDISH ECONOMIC POLICY REVIEW 5 (1998) 303-343

Anatomy of policy complementarities

Mike Orszag and Dennis J. Snower *

During the past 25 years, employment policies in many European countries have mostly failed to address the unemployment problem in an adequate way. Policy makers differ on why this has been so. Some contend that the problem is due to policy ineffectiveness, namely, it is alleged that the available policy instruments have little influence on unemployment. Others believe that unemployment policies are pointless, because they merely replace the unemployment problem by an inequality problem. And yet others believe that the underlying problem is one of policy inactivity, namely, the policy initiatives have been too few and too timid.

All these influential theses, we claim, are myths. Instead, we argue that European unemployment policies have been frequently unsuccessful because governments have generally failed to exploit economic and political complementarities among policy measures. *Economic complementarities* exist when the effectiveness of one policy depends on the implementation of other policies. *Political complementarities* arise when the ability to gain political consent for one policy depends on the implementation of other policies.

This paper examines the causes and consequences of these complementarities, investigates the interplay among them, and analyses how unemployment policies are to be formulated in this context.

Various contributions in the economic literature are relevant to these concerns. Coe and Snower (1997) identify various sources of economic complementarities.[1] Some empirical evidence of economic

* We are deeply indebted to Lars Calmfors, Bertil Holmlund and Assar Lindbeck for comments.

[1] Coe and Snower (1997) examine economic complementarities in a static context. This paper, however, shows that the dynamic aspect of the reforms turns out to be particularly significant because as implied by the underlying model in Appendix B, the appropriate policy strategy can depend heavily on dynamic factors such as people's rate-of-time discount and their degree of risk aversion (or, equivalently in our model, the elasticity of intertemporal substitution) regarding their consumption and work through time.

Moreover, due to the existence of labour-turnover costs (such as costs of hiring, training, and firing), employed people generally have far greater chances of complementarities emerged in several recent studies.[2] Several contributors have examined why a particular political process may yield labour market policies associated with excessive unemployment (e.g., Saint-Paul, 1993). But so far no attention has been given to how political policy complementarities arise alongside the economic ones, and what this network of complementarities implies for policy making. These important gaps are the subject of this paper.

In this paper, Section 1 discusses the three myths about unemployment policy-making and how our analysis of complementarities debunks them. Section 2 constructs a simple framework for thinking about economic and political complementarities. Section 3 examines how to make policy decisions in the presence of these complementarities. And Section 4 examines how political constraints on policy change can be overcome through broad-based reform packages that take advantage of the existing economic and political complementarities among the individual policy measures.

1. The three myths

During the past two decades, European unemployment policy has been conducted in the shadow of three powerful (although partially contradictory) myths.

1.1. The policy ineffectiveness myth

The *policy ineffectiveness myth*—that the available policy instruments are ineffective regarding unemployment—is an insidious one. It diverts policy makers from focusing on how to create employment and implies that their main objective should be to spread the burden of unemployment more equally across the working-age population, primarily through working-time reductions and early retirement schemes. The dangers of this policy approach are well known.[3] But

keeping their jobs than unemployed people have of acquiring them. So a policy that helps move people from unemployment into employment during one time period will influence the unemployment rate in subsequent time periods. This means that the long-term effects of complementary policies may be substantially larger than their impact effects. This paper attempts to quantify these long-term effects for plausible economic parameters.

[2] See Buti et al. (1998), Daveri and Tabellini (1997), and Elmeskov et al. (1998).

[3] It has proved very difficult to implement worksharing and early retirement without raising non-wage labour costs (particularly costs of hiring and training) and thereby discouraging firms from creating more jobs. Furthermore, by diminishing

beyond that, our analysis suggests that—despite the continued high levels of European unemployment in the face of numerous attempts at policy reform—the available unemployment policies may well *not* be inherently ineffective. The reason is that past reforms have often failed to exploit economic complementarities.

It is easy to see how such complementarities may arise. It is impossible for people to find more work when firms do not provide new jobs, and it is impossible for firms to fill their vacancies when there is no one looking for them. Thus supply-side labour market policies (e.g., job search-promoting measures such as job counselling) are complementary with demand-side policies (e.g., measures to stimulate investment demand). Furthermore, tax breaks for hiring the long-term unemployed (such as those in France or Germany) may be ineffective in the presence of generous unemployment benefits, because the benefits will discourage the unemployed from taking advantage of the tax breaks. Giving employers greater latitude in negotiating fixed-term contracts (as in Spain) may do little to stimulate employment unless the job-security provisions associated with the incumbent employees are relaxed (Bentolila and Dolado, 1994). Reducing the magnitude and duration of unemployment benefits may have only a limited effect on the employment rate in the presence of large incapacity benefits (as in the Netherlands) or high minimum wages (as in France).

In the presence of economic complementarities, individual unemployment policy measures might look ineffective—but only when the overall package of policies is insufficiently broad, i.e., when the package covers an insufficiently wide range of policies within a set of economically complementary ones.

1.2. The unemployment-inequality myth

According to the *unemployment-inequality myth*, governments must choose between two disagreeable options: a flexible labour market bedevilled by wide income disparities and an inflexible labour market crippled by unemployment. The flexible market, where people's wages reflect their productivities, is allegedly achieved by reducing job

the number of people competing for jobs, early retirement may put upward pressure on wages and thereby on prices. Monetary and fiscal authorities may then feel called upon to dampen inflation through contractionary policies, thus generating further unemployment.

security, restricting unemployment benefits and welfare entitlements, eliminating minimum wages, and bashing the unions. The inflexible market, where people's earnings reflect politicians' judgements about fairness and social cohesion, is supposedly achieved by the opposite policies. The ultimate choice, then, is between unemployment and inequality.

We argue that the unemployment-inequality trade-off should not be regarded as an exogenous constraint on policy making. On the contrary, it is commonly the *outcome* of unenlightened policies. The system of unemployment benefits financed through general taxes is a good example. When unemployed people find jobs, their unemployment benefits are withdrawn and taxes are imposed on them and their employers. Thus this policy discourages the unemployed from seeking work and employers from providing it. Within this system, reducing unemployment benefits would reduce unemployment, but only by making the unemployed worse off relative to the employed. What usually gets overlooked is that this unemployment-inequality trade-off is the *outcome* of the policy under consideration, which makes it impossible to compensate the unemployed for a decline in benefits. As shown in Section 4, a broader set of complementary policies would permit such compensation.

Our analysis suggests that by distributing the incentives to work more equally across the working population, it may be possible to reduce unemployment *and* inequality. Economically complementary policies have an important role to play in shifting the unemployment-inequality trade-off. Narrow packages of reforms (defined as packages that do not exploit the existing economic complementarities) are generally associated with unnecessarily unfavourable trade-offs between unemployment and inequality. In contrast, broader packages could relax these disagreeable trade-offs.

1.3. The inactivity myth

Finally, the *inactivity myth* (that European governments have not done anything to reduce unemployment) is false, because most European countries have been far from inactive on unemployment policy during the 1980s and 1990s. The problem is that the employment policy strategies have not, on the whole, focused on exploiting policy complementarities. But examples of policy activity abound.

France, whose unemployment continues to hover around 12%, implemented various measures to promote employment and stimulate job search, including reductions in employers' social security contributions, subsidies for young workers and the long-term unemployed, training programmes and more flexible working-time arrangements. In addition, the French unemployment benefit system was reformed to reduce the duration of unemployment benefits and to permit the size of the benefits to fall with their duration.

Spain, with an unemployment rate that remains stubbornly above 20%, has undertaken an impressive variety of initiatives during the past one and one-half decades. In 1984, Spain introduced fixed-term contracts with low statutory severance pay. In the early 1990s, the Spanish government reduced the magnitude and duration of unemployment benefits and raised the minimum employment period that creates entitlement to benefits. Since then, regulations limiting labour mobility were dismantled, the monopoly of the state employment agency was ended, and firms were given opportunities to opt out of some aspects of sectoral wage agreements. In addition, the government introduced apprenticeship wage contracts associated with remuneration below the minimum wage and low non-wage labour costs.

Italy, whose unemployment is still stuck at around 12%, has also conducted a long list of supply-side reforms over the 1990s. Wage indexation (the *scala mobile*) was abolished, making wages more flexible in response to labour market pressures. Hiring regulations were liberalised and job search programmes were instituted.

Belgium, with an unemployment rate of 12.5%, tightened unemployment insurance eligibility requirements for the long-term unemployed, and for temporary and part-time workers. Wage indexation was watered down; tax exemptions were granted for the hiring of young workers; and training programmes for the long-term unemployed were introduced.

Despite this record, the inactivity myth is not entirely off the mark. Although most European countries have witnessed many reforms, these reforms have often been implemented in a partial, piecemeal, and timid fashion. Furthermore, European countries that have implemented labour market reforms (such as those previously discussed) have often retained labour market measures that have tended to undercut these reforms. For example, the previously discussed French reforms were probably undercut by the maintenance of restrictive, minimum-wage legislation. And the effectiveness of the Spanish reforms was probably reduced through the maintenance of stringent job-security legislation for incumbent employees in the primary sector of the economy (see, for example, Bentolila and Dolado, 1994). With two notable exceptions—the Netherlands and the UK—policy changes have typically been introduced one at a time, each rationalised on a stand-alone basis rather than as part of a self-reinforcing package of complementary policies.

If many existing labour market measures are economically undesirable, that is, if they are inefficient and inequitable, why was not more comprehensive reform undertaken? This question is a political, rather than an economic one. What is it about the democratic political process that has kept many European governments from implementing bolder, more enlightened reforms?

To shed light on this important issue, we argue that *political complementarities* characterise unemployment. For example, as our analysis indicates, the political feasibility of unemployment benefit reform (such as reducing the magnitude and duration of unemployment benefits) depends on tax reform (such as reducing payroll and income taxes) and employment promotion policies (such as hiring subsidies). The reason, we argue, is that single-handed reforms (for example, reducing unemployment benefits without changing any other policy instrument) often pit the interests of the employed against those of the unemployed, creating political deadlock. Broad (many-handed) reforms, by contrast, enable the government to use the efficiency gains from one reform to compensate the losers from another efficiency-promoting reform, and vice versa, thereby breaking the political deadlock.

In the presence of political complementarities, it is not surprising that if policy makers consider a narrow portfolio of reforms, then it will be politically impossible to implement bold changes in the policy instruments under consideration.

1.4. Debunking the myths

The upshot of our analysis is that Europe's cardinal policy mistake has been to focus on an excessively narrow set of policies, and on implementing these policies sequentially rather than in conjunction with one another. Labour market reforms have generally not been formulated conjointly to exploit a network of self-reinforcing economic and political complementarities.

Economic complementarities reinforce the political ones, and vice versa. In particular, the greater are the economic complementarities, the greater is the payoff from broad reforms, and the greater is the government's latitude to break political deadlock through such reforms. Conversely, the easier it is to break political deadlock through broad reforms, the more latitude the government has to exploit economic complementarities among the individual reform measures.

The combination of economic and political complementarities makes a strong case for broad-based reform. In the presence of such complementarities, policy makers do not have a choice between broad reform (using many policy instruments in conjunction with one another) and deep reform (using an individual policy instrument intensively). The reason is that deep reform is generally associated with unfavourable unemployment-inequality trade-offs, so that less unemployment can be achieved only by making some people significantly better off at the expense of making others significantly worse off. Such a course is often politically unacceptable. So when there are significant policy complementarities, deficient breadth of reform may rule out sufficient depth.[4]

We argue that the deficient breadth of much European labour market reform during the past two decades has made it politically unfeasible to do more than small, incremental, piecemeal adjustments of prevailing policy packages. Thus the deficient breadth of reform packages has been responsible for their deficient depth, as evidenced by the small changes in replacement ratios, duration of unemployment benefits, or severance pay requirements in many European countries.

For significant labour market reforms to become politically feasible, the unemployment-inequality trade-offs must be relaxed, and that becomes achievable through broad reform. Broad reform strategies are not just more effective because of economic complementarities, but may also permit the implementation of deep reforms through the exploitation of political complementarities.

2. A simple framework for thinking about policy complementarities

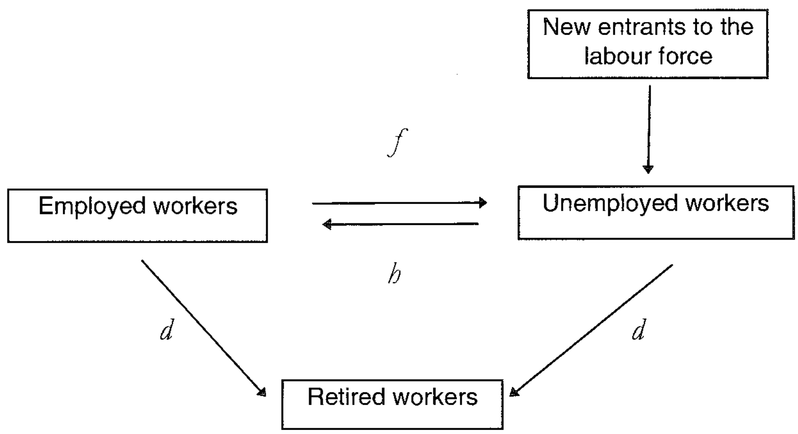
To formulate strategies for broad-based policy reform, we need a framework for thinking about policy complementarities. To keep the

[4] It is true that when there is deficient breadth, any increase in breadth often implies that there is less need for each component of a labour market policy package to be implemented as deeply as would otherwise have been necessary.

framework simple and transparent, we strip labour market activity down to essentials.

Consider a labour market in which workers are either employed or unemployed. Each employee has a chance f of becoming fired (and joining the unemployment pool), and each unemployed person has a chance h of being hired (and joining the ranks of the employed). Moreover, the employed and unemployed workers retire at rate d, and new workers enter the labour force at the same overall rate, so that the aggregate labour supply remains constant through time. Figure 1 illustrates these transitions between employment and unemployment, and into and out of the labour force.

Figure 1. Labour market flows



Each employed worker receives an income that consists of the wage (w), paid by her employer, minus a tax on wage income, falling on the worker. Let t be the tax rate, so that the employee's income is $w(1 - t)$. Moreover, each unemployed worker receives an unemployment benefit (b).

Table 1. Incomes

Employed worker	Unemployed worker
Wage income: $w(1\text{-}t)$	Unemployment benefit: b

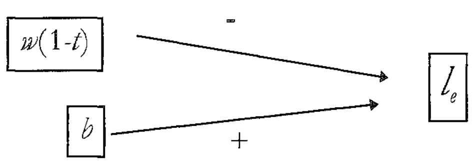
To fix ideas, our analysis of economic and political complementarities focuses on the interrelations between the influences of two specific policies on unemployment: unemployment benefit reform (namely, reducing b) and tax reform (namely, reducing t). Let us examine how these policies affect the incentives of the employed and unemployed workers.

2.1. Incentives to work and seek work

We focus on employees' incentives to work and unemployed people's incentives to seek work. An *employee's work effort* may be portrayed in terms of how she divides time between work and leisure while on the job. In each period, the employee decides to spend an amount of time, l_e, on leisure (where the subscript e stands for employee) and the remainder on work.

Moreover, the less effort the employee devotes to her job (i.e., the more leisure l_e that the employee takes on the job), the greater are her chances of getting fired.[5] So the employee faces an intertemporal trade-off. She enjoys leisure, but taking this leisure now raises her chances of losing the job in the future, thereby experiencing a drop in income. The greater the differential between the employee's income and the unemployment benefit, the greater the cost of losing the job, and consequently the harder the employee will work (i.e., the less leisure she will take).

Figure 2. Influencing work effort



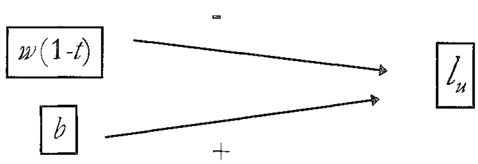
Notes: The greater is wage income ($w(1 - t)$) relative to the unemployment benefit (b), the less leisure the employee takes on the job (and thus greater is the employee's work effort).

[5] There are many possible reasons for this phenomenon. For example, the employer may find it worthwhile to promote work incentives by undertaking to fire an employee if her productivity falls beneath a specified minimum level. The employee's productivity, furthermore, may depend on the amount of time she devotes to work, as well as on some random factors (accidents, diseases). So the more leisure the employee takes on the job, the lower the chance of exceeding the minimum, acceptable productivity level and thus the greater her chances of being fired.

Along similar lines, an *unemployed person's effort in seeking work* may be depicted in terms of how much time he spends looking for a job. In each period, the unemployed person spends a fraction of time, l_u, on leisure (where the subscript u stands for unemployed) and the remainder on job search.

The less effort the unemployed person devotes to job search (i.e., the more leisure l_u the unemployed person consumes), the lower are his chances of finding a job and thus the lower the chances of getting hired. This person also faces an intertemporal trade-off. The more leisure he takes, the better off he is now, but the worse off he will be in the future, for the smaller will be the chances of experiencing a rise in income. The greater the differential between the wage income and the unemployment benefit, the greater the benefit of finding a job, and consequently the harder the unemployed worker will search.

Figure 3. Influencing search effort



Note: The greater is wage income ($w(1 - t)$) relative to the unemployment benefit (b), the less leisure the unemployed worker takes (and thus greater is the unemployed person's search effort).

So unemployment benefit reform (reducing b) and tax reform (reducing t) stimulate the incentives to work and seek work, because they both widen the differential between the incomes received by employed and unemployed people.

2.2. Incentives to hire and fire

The firms make the employment decisions, namely, they determine the hiring rate (the chances that an unemployed worker is given a job) for any given level of search effort (l_u) by the unemployed. The firms also determine how the firing rate (the chances that an employed person loses a job) responds to work effort (l_e). These decisions are made so as to maximise profits.

Like the workers, the firms face trade-offs. On the one hand, the greater the hiring rate is, the greater are the firm's hiring costs. On the other hand, the more hirings are made, the greater are their revenues (from the output produced by the newly hired employees). Regarding firing, firms face explicit firing costs and effort-related costs: the greater is the firing rate, the smaller is the gain from work effort (because the job may be terminated sooner), and thus the smaller will be employees' work effort. The firm also has benefits from firing: the more responsive is the firing rate to work effort, the greater will be the work incentive. The firms seek to achieve the hire and fire rates that maximise their profits, subject to the trade-offs described above.

2.3. Sources of economic complementarities

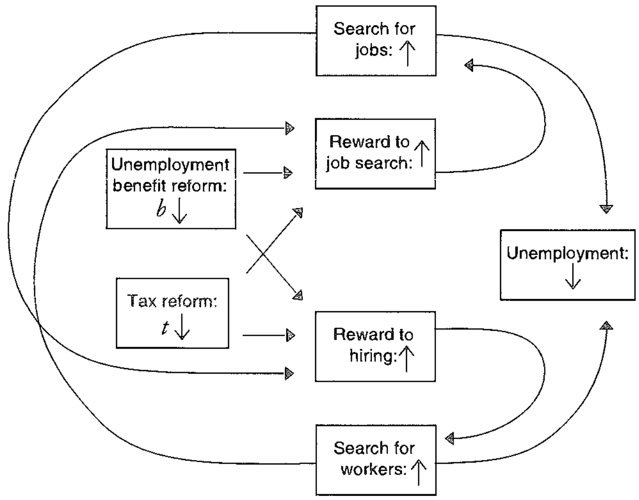
In this context, it is easy to see how economic complementarities can arise. The following are two major sources.

First, the most basic complementarity between unemployment benefits and taxes arises because *the firms' search for workers reinforces the workers' search for jobs, and vice versa.* It is no use to give the unemployed incentives to seek jobs (say, by reducing their unemployment benefits) if firms lack incentives to hire them (say, because payroll taxes are too high). Conversely, it is no use to give the firms incentives to create new jobs if workers lack the incentives to seek them. In this way, unemployment benefit reform (promoting search for jobs) is complementary to tax reform (promoting search for employees).

Figure 4 illustrates the economic linkages responsible for this complementarity. Here the economic complementarities may be identified through these causal relations:

- Unemployment benefit reform (a fall in b) raises the workers' reward to job search, which stimulates the amount of search the workers do. This, in turn, increases the reward from hiring, for the harder the workers search for jobs, the cheaper it is for employers to hire them. Thereby unemployment benefit reform gives more leverage to the influence of tax reform (a fall in t) in simulating the reward to hiring (namely, tax reform stimulates hiring).
- Furthermore, tax reform raises the reward to hiring, which stimulates the employers' search for workers. This, in turn, raises the reward to job search, for the harder employers search for workers, the more likely will workers' searches be successful. Thereby tax reform increases the effectiveness with which unemployment benefit reform stimulates the reward from job search.

Figure 4. Economic complementarities operating through the interaction between the search for jobs and the search for workers

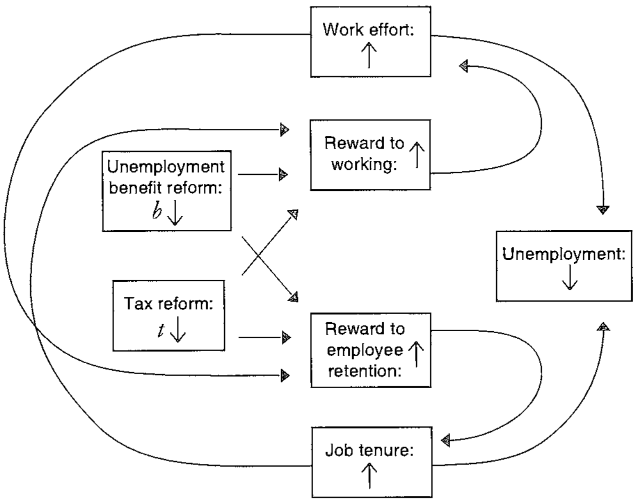


Second, a complementarity between unemployment benefit reform and tax reform arises because *employees' work effort reinforces employers' retention decisions, and vice versa.* There is little point to give employees incentives to work hard (say, by reducing unemployment benefits) if firms have no intention of retaining them; and on the other side, there is little point to give firms incentives to retain their employees if these employees lack incentives to work. Figure 5 illustrates the relevant causal relations. Now the economic complementarities work themselves out through these channels:

- Unemployment benefit reform raises the workers' reward to work effort, which stimulates the employees' work effort. This, in turn, raises the firms' reward from retention, because the harder the employees work, the more worthwhile it is for the firms to retain them. So unemployment benefit reform increases the effectiveness of tax reform in stimulating the firms' reward from retention.
- Tax reform increases the reward to employee retention, and thus increases the length of employees' job tenure. This, in turn, stimulates the reward to working, because the longer employees can expect to remain employed, the larger is their reward for their work effort. In this way, tax reform increases the leverage of unemployment benefit reform in stimulating the reward for work effort.

These are particularly significant, but by no means the only complementarities operative in our model. Appendix A contains further examples of complementarities.[6]

Figure 5. Economic complementarities operating through the interaction between work effort and the employee retention



2.4. Assessing economic complementarities

The total degree of the economic complementarities between unemployment benefit reform and tax reform may be measured by a statistic called the *cross-elasticity of unemployment with respect to unemployment benefits and taxes*. This measure indicates how much the responsiveness of unemployment to the unemployment benefit is influenced by the tax (or equivalently, by how much the responsiveness of unemployment to the tax is influenced by the unemployment benefit).[7]

Table 2 provides computations of these cross-elasticities for various levels of unemployment benefits and tax rates. These computations are based on plausible parameter values for our model, built on

[6] It is worth noting that, although unemployment benefits are not taxed in our model, the complementarities described here occur regardless of whether such taxes are levied.

[7] Specifically, the responsiveness of unemployment to the unemployment benefit is computed as the percentage change in the unemployment rate resulting from a percentage change in the unemployment benefit. Then the cross elasticity is the percentage change in the above responsiveness resulting from a percentage change in the tax.

the previously described analytical framework (and specified in Appendix B).

Row 1 of Table 2 describes the baseline position of our model economy. Welfare effects of alternative tax-benefit policy combinations are evaluated relative to this baseline. In column 1, b is given in terms of the replacement ratio (the ratio of unemployment benefits to the wage). Column 2 gives the tax rate t. Columns 3 and 4 specify the elasticity of unemployment with respect to the replacement ratio and the elasticity of unemployment with respect the tax rate, respectively. Column 5 shows the cross-elasticities. These economic complementarities are brought into sharp relief in Figure 6, which plots cross-elasticities corresponding to a range of tax and benefit values.

Table 2. The effects of alternative tax-benefit policy combinations

b	t	η_b	η_T	Cross-elasticity	GB[a]	WoE[b]	WoU[c]	U[d]
.40	.10	1.56	.17	.134	Balanced	57.28	55.13	.099
.35	.09	1.27	.12	.086	Surplus	↑	↓	.090
.36	.093	1.33	.14	.095	Surplus	↑	↓	.091
.362	.092	1.34	.13	.095	Balanced	↑	↓	.092
.38	.092	1.43	.14	.106	Deficit	↑	↑	.092
.41	.102	1.64	.18	.147	Deficit	↓	↑	.101
.45	.111	1.94	.238	.212	Deficit	↓	↑	.111

Notes: Baseline parameter values are reviewed in Appendix B.

[a] Government budget

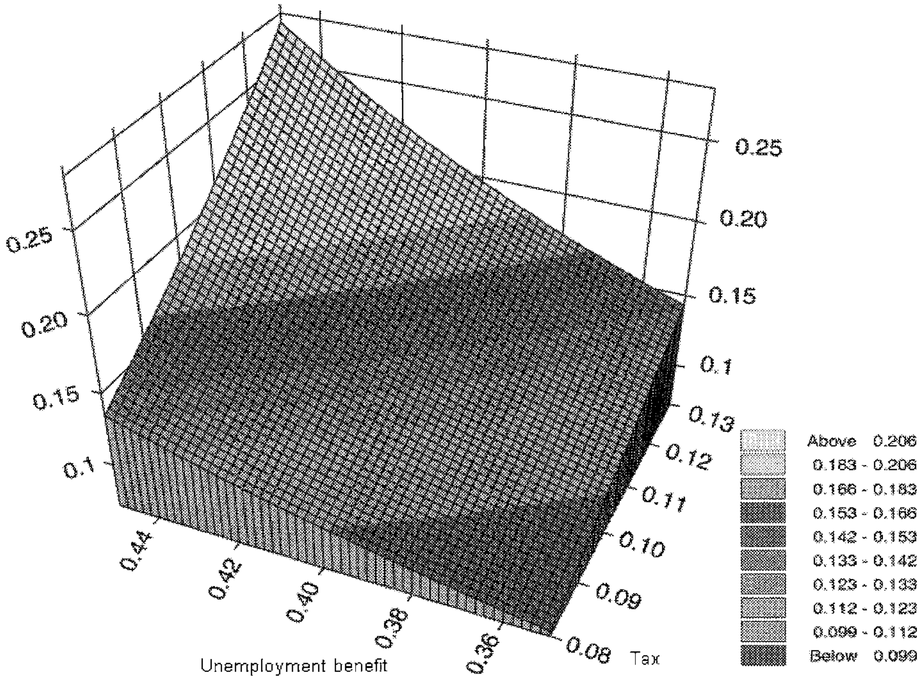
[b] Welfare of employed

[c] Welfare of unemployed

[d] Unemployment rate

Table 2 and Figure 6 convey a strong message: *First,* all the cross-elasticities are positive, which means that the unemployment-reducing effect of benefit reform (a fall in b) is always augmented through tax reform (a fall in t). *Second,* the cross-elasticities rise as the unemployment benefit and the tax rate rise. This means that the higher the unemployment benefit and the tax rate, the more benefit reform and tax reform reinforce one another with respect to unemployment. In short, the gains from exploiting the economic complementarities are greatest when taxes and transfers are highest.

Figure 6. Economic complementarities (the cross-elasticity of unemployment with respect to benefits and tax)



Intuitively, when unemployment benefits and taxes are high, the resulting deficient reward to job search reinforces the resulting deficient reward to hiring. Because the deficiencies are large, the reinforcement effects are large as well. Under these circumstances, the economic complementarity from reducing unemployment benefits and taxes are particularly significant.

Another reason why the cross-elasticities are high when unemployment benefits and taxes are high is that high benefits and taxes lead to deficient rewards to working and deficient rewards to employee retention. Again, these deficiencies reinforce one another, and thus the economic complementarity from unemployment benefit and tax reductions are large when benefits and taxes are high initially.

Figure 7. Unemployment

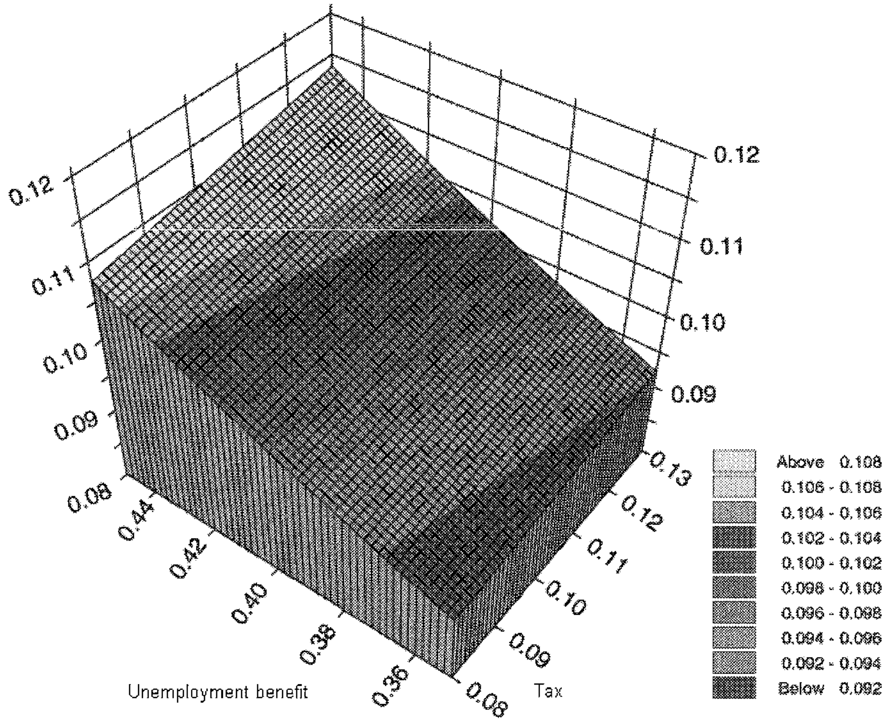


Figure 7 illustrates the upshot of these economic complementarities and shows how the unemployment rate depends on the unemployment benefit and the tax. Observe that the unemployment rate not only rises with the benefit and the tax; it rises particularly fast when the benefit and the tax are increased together.

3. Policy decision making in the presence of complementarities

The existence of economic complementarities indicates that there may be a payoff to setting different policy instruments conjointly, but it offers little guidance on how to do so. The reason is that we have said nothing so far about whether the government is able to finance the previously mentioned complementary policies (for example, not all the policies in Table 1 leave the government's budget in balance). Furthermore, we have not considered whether the policies are politically feasible. (For example, only one of the policies in Table 1 makes both the employed and unemployed people better off, and thus political consensus in favour of the other policies may be difficult to achieve.) To understand how different policy measures can be used in conjunction with one another to achieve a socially desirable and politically feasible unemployment rate, it is necessary to consider the budgetary and political constraints that governments face. This section provides a simple framework of thought for these issues

We do so in a sequence of steps. *First*, we examine the government budget constraint, which describes what combinations of benefits and taxes the government can afford. *Second*, we describe the status quo of the labour market, i.e., the initial position that the government seeks to improve. *Third*, we specify the aim of government policy, i.e., its objective in terms of unemployment and inequality. And *fourth*, we show why this aim may be impossible to achieve because of political constraints. In Section 4, we then examine how political deadlock can be overcome by broadening the portfolio of policy measures.

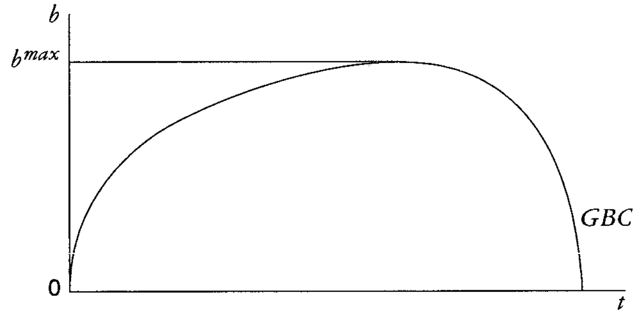
The scenario[8] we examine in this section may be termed the *Franco-German nightmare* (where France and Germany are perhaps the most prominent, but by no means the only European countries to have exhibited these economic symptoms): unemployment is undesirably high, as are unemployment benefits and taxes, but the government finds it politically infeasible to do anything about this problem.

3.1. The government budget constraint

To capture the government's budgetary restrictions in a transparent way, let us suppose that the money spent on unemployment benefits must be raised through taxes. Figure 8 depicts the government budget constraint (*GBC*) in the context of the previously described labour market.

[8] This scenario is generated by the plausible parameter estimates given in Appendix B. Of course, different estimates are able to generate different scenarios (as defined by the relative shapes and positions of the government budget constraint and the indifference curves of the employed and unemployed people, described below). We concentrate on the scenario above because it appears to typify an important problem of policy decision making in Europe.

Figure 8. The government budget constraint



Clearly, when the government makes no transfers, it need not raise taxes: so when the unemployment benefit $b = 0$, then the tax rate $t = 0$ as well. Thus the government budget constraint goes through the origin of the figure.

If the ratio of unemployed people to employed people was constant, a rise in the unemployment benefit at an unchanged wage must be financed by a proportionate rise in the tax rate. But as the unemployment benefit rises, the number of unemployed people rises relative to the number of employed ones. So equal incremental increases in the unemployment benefit b require larger and larger incremental increases in the tax rate t. This phenomenon is amplified by the fact that the increases in the unemployment benefit and tax rate also raise unemployment and reduce employment (by reducing the reward to work), further raising transfer payment and further eroding the tax base.[9] Consequently, the government budget constraint in the figure becomes progressively flatter as the unemployment benefit b rises.

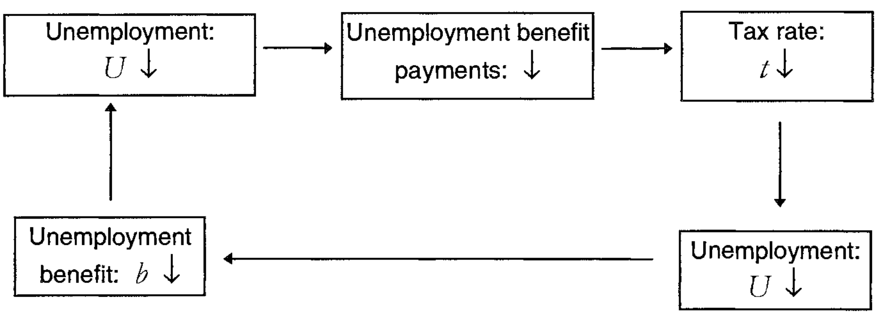
Eventually, the unemployment benefit reaches a maximum, b^{max} in the figure. Beyond that, further increases in the tax rate (t) reduce the

[9] Naturally, an increase in the unemployment benefit b may also lead to an increase in the wage w. This effect *increases* the tax base, enabling the government to keep the tax rate lower than it would otherwise have been. In our parameterisation of the model in Appendix B, this effect is dominated by the influences outlined in the text above.

tax base by so much that tax revenues can no longer fund transfers at the rate of b^{max} per head. So the unemployment benefit declines. This is the well-known *Laffer effect*, pictured by the downward-sloping portion of the government budget constraint in the figure.

Another useful way of viewing the government budget constraint is in terms of its implications for unemployment benefit reform and tax reform. Along the upward-sloping portion of the government budget constraint, unemployment benefit reform reinforces tax reform and vice versa: a drop in unemployment benefits permits the government to finance a drop in taxes, and vice versa. As result, unemployment falls, which enables the government to lower unemployment benefits and taxes even more, and so on. These successive declines in unemployment benefits and taxes may be called the *government budget multiplier.*

Figure 9. The government budget multiplier

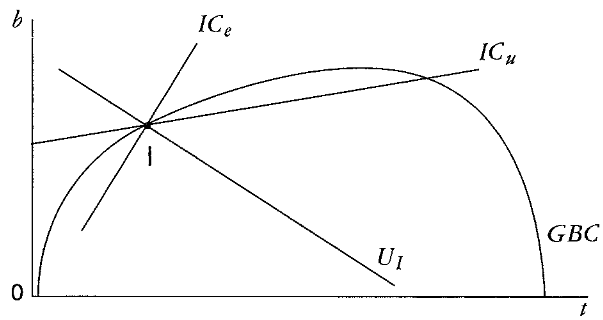


The larger are the economic complementarities between the two policies, the more will a given reduction in unemployment benefits and taxes reduce unemployment, and consequently the larger will the government budget multiplier be.

3.2. The status quo of the labour market

The status quo position of the labour market may be represented by a point on the government budget constraint, such as point *I* in Figure 10 (where *I* stands for *initial* position).

Figure 10. The status quo position



The welfare of the unemployed people at the status quo point may be illustrated by the indifference curve IC_u, going through point *I*. This indifference curve is the set of points along which the unemployed people are equally well off.[10] Observe that this indifference curve is upward-sloping: An increase in the unemployment benefit *b* makes the unemployed people better off and an increase in the tax rate *t* makes them worse off (because it reduces their income once they become employed). So a rise in the unemployment benefit must be offset by a rise in *t* so that the unemployed remain equally well off along the indifference curve.

The welfare of the employed people at point *I* may be illustrated by the indifference curve IC_e, going through point *I*. This indifference curve, which is the set of points along which the employed people are equally well off, is also upward sloping. A rise in the tax rate *t* makes the employed people worse off (because it reduces their income), while a rise in the unemployment benefit *b* makes them better off (because it increases their purchasing power when they become unemployed). So a rise in the benefit must be counteracted by

[10] For visual ease, this indifference curve (and the one for employed people) is drawn as a straight line, although it is not entirely straight in the numerical model of Appendix B.

a rise in the tax in order for the employed people to remain equally well off along the indifference curve.

The indifference curve of the employed people is steeper than that of the unemployed. The reason is that the well-being of the unemployed is more sensitive to unemployment benefits (which they receive now) than to taxes (which they must pay only once they find jobs in the future). By the same token, the well-being of the employed is more sensitive to taxes (which they pay now) than to unemployment benefits (which they would receive only if they become unemployed in the future).

The level of unemployment at point I is depicted by the iso-unemployment curve U_I, describing the set of points along which unemployment is the same as at point I.[11] Observe that because a rise in the unemployment benefit b raises unemployment, a fall in the tax rate t is required to keep unemployment constant. So the iso-unemployment curve is downward sloping. The closer an iso-unemployment curve lies to the origin (where $b = t = 0$), the lower the level of unemployment (for the lower is the unemployment benefit and tax rate).

We now ask whether, starting from the status quo point I, the government can improve people's welfare through unemployment benefit and tax reform.

3.3. Policy decisions and the political process

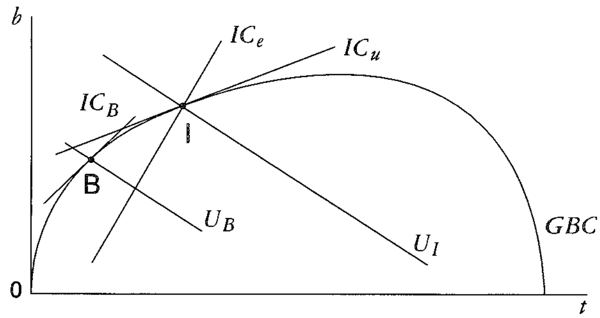
Given that the wage, work effort, and job search are outside the government's direct control, what position could the labour market achieve if the political process worked perfectly, that is, if the political process would permit the government to set its policy instruments so as to maximise the sum of everyone's welfare? We call the resulting labour market position the *Benthamite* position, because it is the political equivalent of Bentham's goal to achieve "the greatest happiness of the greatest number."

In our analysis, Benthamite social welfare is a weighted average of the welfare of the employed and unemployed people. So the Benthamite indifference curve, IC_B, is a weighted average of the employed and unemployed people's indifference curves. It is upward

[11] For visual ease, the iso-unemployment curve and the indifference curves are depicted as straight lines in the figure, although they are actually curved in the model underlying the exercise.

sloping, because its slope lies between that of the employed and unemployed people's indifference curves. The Benthamite position is pictured by point B in Figure 11. U_B depicts the level of unemployment in this situation. It is lower than the unemployment in the initial situation (U_I), because the sum of everyone's welfare is maximised at a lower unemployment benefit level and a lower tax rate.

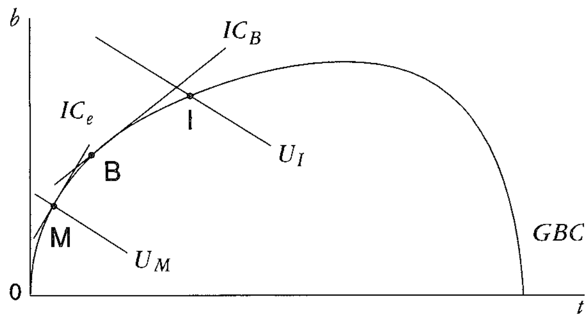
Figure 11. The best politically achievable position



Let us now shift our attention from the best politically achievable position to what may be politically feasible within the democratic political process. An influential model of this process is the median voter theory, which indicates that if political decisions are taken by majority rule, the outcome will be in accord with the preferences of the median voter. Because employed people virtually always outnumber unemployed people by a large margin, the median voter is generally employed. So in the context of our labour market model, the median voter theory asserts that the voting process will yield a set of policies that make the employed people as well off as possible.

Figure 12 shows that the highest indifference curve of the employed people is the one that just touches the government budget constraint, so that point M is the outcome of the majority voting process. The line U_M depicts unemployment in this equilibrium.

Figure 12. The median voter outcome



Observe that point M lies beneath point B (the Benthamite position) along the government budget constraint. After all, point M reflects just the employed people's preferences, whereas point B reflects a weighted average of the employed and unemployed people's preferences. And the employed people are more in favour of tax reductions and less in favour of unemployment benefit increases than the unemployed. So the democratic process (via the median voter) leads to lower unemployment benefits and taxes—and thus also to lower unemployment—than the outcome from a perfectly functioning political process (the Benthamite position).[12] Usually one would expect employees to prefer less labour market reform than the unemployed, but in the case of unemployment benefits, the opposite is the case, because a drop in unemployment benefits would permit the employed people to enjoy tax cuts.[13]

[12] In terms of the geometry of the figure above, observe that since the Benthamite indifference curve is a weighted average of the indifference curves of the employed and unemployed people, and since the employed people have the steeper indifference curve, the employed people's indifference curve must be steeper than the Benthamite indifference curve. Consequently point M must lie beneath point B along the government budget constraint.

[13] But this does not mean that the democratically determined unemployment benefits and taxes also turn out to be below their *socially optimal levels*. Quite on the contrary, the socially optimum point may be expected to lie closer to the origin along the budget constraint than both the Benthamite point and the median voter point. After all, the unemployed want more than the socially desirable level of unemployment benefits, since they do not take full account of how these benefits—and the associated taxes—reduce the employed people's chances of retaining their jobs. And the employed may receive excessive wages in the status quo position of the labour market (since employers use wages to stimulate job search and work effort and since the employed have market power) and these people do not take full ac-

But in practice, it is highly unlikely that governments of the advanced, democratic market economies would ride roughshod over the interests of a significant minority of the voting constituency, such as the unemployed. Such behaviour would offend against a principle of liberal democracy, namely, that the majority is allowed to have its way only if it does not involve sacrificing a significant minority. This principle is not only enshrined in a multitude of political institutions; it also seems commonly supported by a majority of voters in these countries. The implication, in practical terms, is that sizeable minorities, such as the unemployed, may in effect be viewed as blocking coalitions with regard to policies that hurt them.

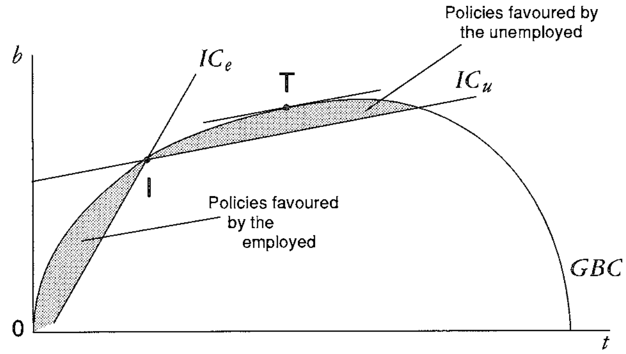
Accordingly, in the context of our model, it is reasonable to examine a political process in which only those policies are feasible that improve the welfare of the employed *and* the unemployed. As Figure 13 indicates, the set of policies favoured by the employed people are those in the shaded area above their indifference curve IC_e and under the government budget constraint, while the set of policies favoured by the unemployed people are those in the shaded area above their indifference curve IC_u and under the government budget constraint.

The problem is that, for the scenario depicted by the Franco-German nightmare, these two shaded areas do not overlap.[14] So there is *no set of policies* that can be passed by the political process. Consequently, the labour market is stuck at wherever it happens to be initially. This phenomenon may be called *political hysteresis*; it helps explain policy paralysis even in the face of high unemployment.

count of how these wages discourage employment and thereby reduce the unemployed people's chances of finding work. So both the employed and unemployed may have an incentive to vote for higher unemployment benefits and higher taxes than is democratically achievable or even socially desirable.

[14] In this scenario, as shown in the figure, the indifference curve of the employed people (IC_e) is steeper than the budget constraint at the status quo point *I*, whereas the indifference curve of the unemployed people (IC_u) is flatter.

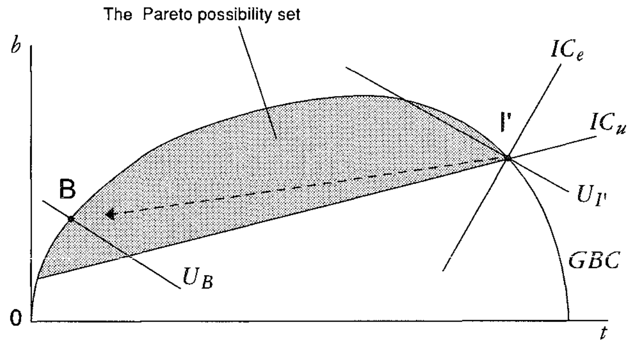
Figure 13. Political hysteresis



It is easy to see that *all* points on the government budget constraint from 0 to point T could represent initial positions characterised by political hysteresis.[15] But if the economy's initial position lies to the right of point T, this deadlock may be overcome. Such a situation might arise in the presence of a severe recession, when the employed and the unemployed may want lower unemployment benefits and lower taxes to generate more jobs. At point I' in the Laffer portion of the government budget constraint in Figure 14, for instance, the set of policies favoured by the employed and unemployed people are those lying above their respective indifference curves (IC_e and IC_u respectively) and under the government budget constraint. Observe that now there is some overlap between these two areas. Specifically, the unemployed people's area lies completely within the employed people's area, so that the policies on which both groups could agree now lie in the shaded area, called the *Pareto possibility set* in the figure.

[15] Point T is the point of tangency between the unemployed workers' indifference curve and the government budget constraint.

Figure 14. Policy making under Laffer conditions



Under these circumstances, the Benthamite policy, at point *B*, may now lie in the Pareto possibility set, as illustrated in Figure 14. So it is now politically feasible for the government to move from point *I'* to the Benthamite point, thereby reducing the unemployment rate from $U_{I'}$ to U_B. But to do so, it must implement unemployment benefit reform and tax reform *in conjunction with one another* with the express purpose of exploiting the existing political and economic complementarities. Both policy instruments must be changed *simultaneously* to move toward the social optimum. Piecemeal, uncoordinated reform—in which one policy reform is undertaken at a time—may run the risk of failure, because after the first policy instrument has been adjusted, the economy may arrive at a position of political hysteresis, preventing the second policy instrument from being adjusted as well.[16] These considerations set the stage for an analysis of how political constraints on economic policy may be overcome.

4. Overcoming political constraints through broad-based reform

So far, the upshot of our analysis has been bleak: Even if the status quo of the labour market is inefficient (due to high unemployment) and inequitable (in terms of the welfare of employed versus unemployed people), it may nevertheless be impossible for the government to implement the appropriate policies because of political con-

[16] Such a policy could involve a (suboptimal) horizontal shift from the Laffer portion to the upward-sloping portion of the government budget constraint, or it might involve temporarily running a budget surplus.

straints. Once political hysteresis sets in, the economy may be condemned to perpetuate policies that are not in the interests of society.

Is there any other way out of this box? Our analysis points to a promising answer: broad-based reform. This strategy involves abandoning the traditional approach to unemployment policy making, which involves determining the policy instruments on the basis of *political* criteria and then setting the magnitudes of these instruments according to specific *economic* goals.

This dichotomy between political and economic decisions has inadvertently been supported through the mainstream economic methodology that takes the set of policy instruments as exogenously given and then optimises a policy objective function with respect to these instruments. Our analysis suggests that this approach should be replaced by a new strategy: first to identify the group of policy instruments whose unemployment effect is characterised by significant economic and political complementarities, and then to set these policy instruments conjointly so as to exploit these complementarities.

In short, unemployment policy decisions—concerning the nature of the policy instruments and the degree to which these instruments are changed—are not to be made in isolation from one another. They must be made together, and it is clear why the existence of economic and political complementarities calls for such an approach. In the presence of economic complementarities, individual policy initiatives may be ineffective on their own; their true potential cannot be assessed unless we explore how their influence can be reinforced through other policy initiatives. If the policy measures are implemented in isolation, there is no assurance that such reinforcement will be forthcoming.

Furthermore, isolated policy initiatives are often a recipe for political failure, because each of them on their own has a tendency to create winners and losers. If the losers are sufficiently numerous and powerful, they will be able to block these initiatives, even if the winners stand to gain a lot more than the losers stand to lose. But if politically complementary policies are formulated conjointly, then the losers from one policy can possibly be compensated by becoming the winners of another policy.[17]

To see how this works, let us examine how the problem of political hysteresis in the previous analysis could be resolved by broaden-

[17] Blinder (1987, p. 209ff) provides useful examples of this strategy in the formulation of US tax policy.

ing the set of policy instruments so as to exploit further economic and political complementarities. Recall that the political hysteresis problem, as depicted in Figure 13, involves a simple conflict of interest: The government is unable to achieve the socially desirable position by means of tax and benefit reform, because a reduction of unemployment benefits and taxes would hurt the unemployed, whereas a rise in benefits and taxes would hurt the employed. Now, however, consider including another instrument in the policy package, namely, hiring vouchers (or tax breaks) for firms that hire currently unemployed people.

Because such hiring vouchers improve the welfare of the unemployed, they could compensate the unemployed for a reduction in unemployment benefits. But the vouchers may hurt the employees, because firms would gain an incentive to replace some of their employees with subsidised new recruits. In this case, the employees could be compensated for this loss by a reduction in taxes, made possible through a reduction in unemployment benefits.

The political possibilities for policy reform that emerge with the expansion of the policy package can be illustrated clearly in terms of Pareto possibility sets. Recall that for the previous baseline model (in which only unemployment benefit and tax policies are used, as specified in Appendix B.4 and illustrated in Figure 13) the Pareto possibility set is empty, so that no policy change in politically feasible.

In the baseline model,[18] the replacement ratio (the ratio of unemployment benefits to the wage) is 0.345, the tax rate is 0.1, and the corresponding hire rate is 0.232.

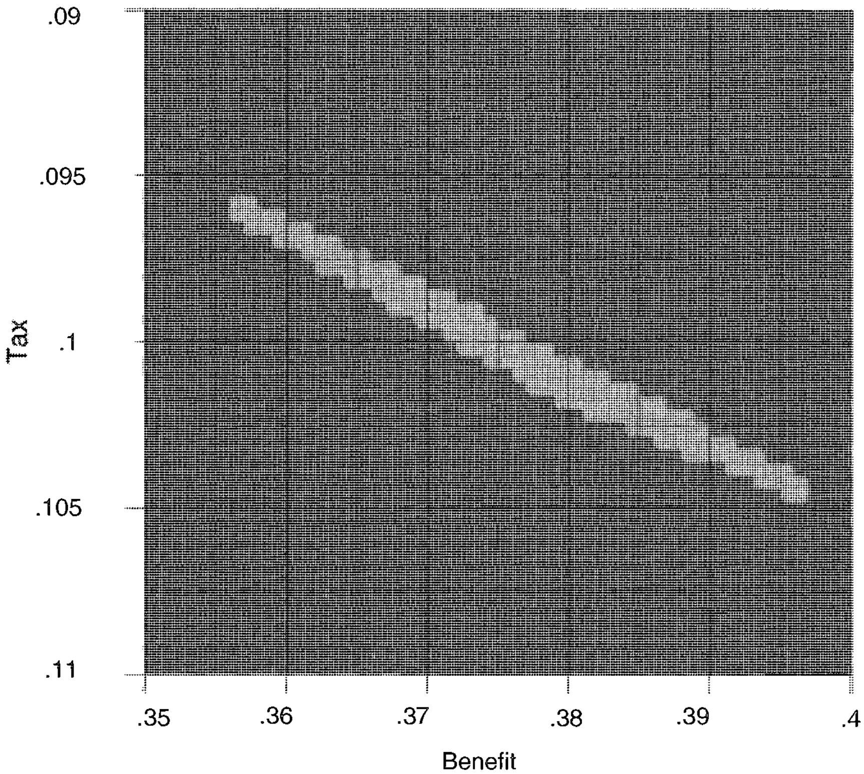
Now consider what happens to the Pareto possibility set when a hiring voucher (financed through reductions in unemployment benefits and taxes) augments the tax and benefit policies. Specifically, let the voucher be 0.2, so that the voucher is 17.3% of the wage. This broadening of the policy portfolio creates a range of tax-benefit policies that improves the welfare of the employed *and* unemployed people and consequently is politically feasible. The feasible range of policies is pictured by the Pareto possibility set in Figure 15.

It is important to emphasise that the political gains from *broad* reform can be reaped only if the reforms are undertaken *simultaneously and in conjunction with one another*. Suppose that, on the contrary, a government introduces a hiring voucher without at the same time im-

[18] The other parameters are specified in Appendix B.

plementing unemployment benefit reform and tax reform. Then the hiring vouchers may reduce unemployment, but once this policy has been implemented, the political deadlock about any further unemployment benefit reform and tax reform may remain. Only through a *simultaneous* implementation of hiring vouchers, unemployment benefit reduction, and tax reductions can political hysteresis be overcome and sizeable expansions of the Pareto possibility set be fully realised.

Figure 15. The Pareto possibility set created by a hiring voucher



5. Concluding thoughts

In sum, our analysis provides a possible explanation for two widespread policy problems in Europe: the disappointingly small unemployment effect of many past reform measures to stimulate job creation and job search, and the political difficulties in implementing more extensive reform programmes. We argue that these problems arise neither because the considered reform measures are inherently ineffective, nor because of the danger that these measures will necessarily replace European-style unemployment by American-style inequality. Rather, what may lie at the heart of the difficulty is the failure of many European governments to consider the implementation of broad-based reform strategies that exploit policy complementarities.

Complementary policies call for a distinctive approach to policy making. When only a small number of unemployment policies (from a broader group of complementary policies) is under consideration, it may be politically impossible to implement them and, even if they were implemented, their influence on unemployment would be small. It is only when a broad set of policies is all implemented in conjunction with one another that they become politically feasible and economically effective.

If our analysis captures something significant, then the timid approach to policy making may simply not be an option. Incremental, small-scale adjustments of existing policy packages may be doomed to failure. Perhaps the only way to tackle the European unemployment problem is to have the courage to think big and broad.

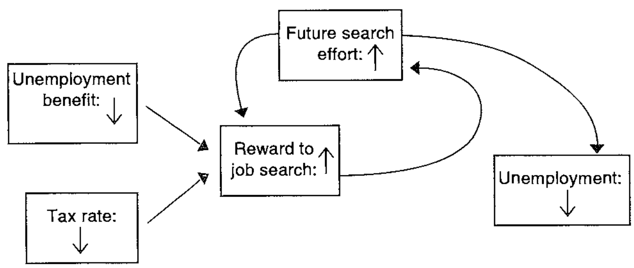
Appendix A. Other sources of complementarities

The paper deals with two prominent economic complementarities, concerning the interaction between the workers' search for jobs and the employers' search for workers and between employees' work effort and employers' retention decisions. In this appendix, we consider two further complementarities, operating intertemporally.

There is an intertemporal complementarity operating through search effort. In the current time period, unemployment benefit reform stimulates the reward to job search and thereby raises current search effort. The increase in current search effort, in turn, raises the chances of finding a job in the future and thereby stimulates future search effort. By how much future search effort will be stimulated depends on the tax burden. In this way, unemployment benefit gives more leverage to the influence of tax reform on search effort.

This intertemporal complementarity also works the other way: Tax reform stimulates search effort, which increases the chances of finding a job in the future, and the resulting stimulus to future search effort depends on the level of unemployment benefits. So tax reform also gives more leverage to unemployment benefit reform.

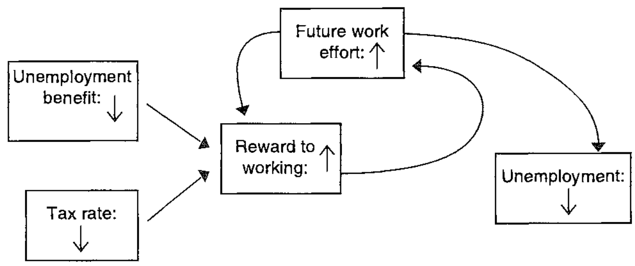
Figure A1. Intertemporal complementarities operating through search effort



Besides, there is an intertemporal complementarity operating through work effort. In the current time period, tax reform stimulates the reward to working and thereby raises current work effort. The increase in current work effort, in turn, raises the employees' chances of keeping their jobs in the future and thereby stimulates future work effort. By how much future work effort will be stimulated depends on the level of unemployment benefits (which is the alternative to wage income). In this way, tax reform augments the influence of unemployment benefit reform on work effort.

Conversely, a drop in unemployment benefits stimulates work effort, which increases the employees' chances of keeping their jobs in the future, and the resulting stimulus to future work effort depends on the tax burden. So unemployment benefit reform also augments the unemployment effects of tax reform.

Figure A2. Intertemporal complementarities operating through work effort



Although there are further sources of complementarities in our model, the previous ones, together with those in the text, are sufficient to illustrate some salient channels whereby unemployment benefit reform and tax reform have complementary effects on unemployment.

Appendix B. The underlying model

Our model is a dynamic efficiency-wage model with labour turnover in the spirit of Phelps (1994, Ch. 15), incorporating worker search and optimising decisions of firms. In this model, unemployed workers receive unemployment benefits and divide their time between leisure and job search, whereas employed workers divide their time between on-the-job leisure (shirking) and work. The hiring rates depend on job search intensity (and thus are negatively related to the leisure of the unemployed workers) and separation rates depend on the effort decisions of the employed workers (and thus are positively related to the leisure of the employed workers). Workers make their search-leisure and work-leisure choices so as to maximise their discounted lifetime utilities, considering the effects of these choices on hiring and firing probabilities.

Firms know how employees adjust their effort in response to higher wages and choose the wage to maximise profits. The firm pays the same wage to all workers but, in setting the wage, it supposes that its choice of wage does not influence the search effort of unemployed workers. The underlying assumption is that although the unemployed workers know the equilibrium wage offered by all firms, they have no information about any individual wage offer that may deviate from this equilibrium wage offer. The firm also chooses the hire rate optimally.

Our exposition of the underlying model is organised as follows. Section B.1 derives the workers' incentives to search and work. Section B.2 covers the worker's decisions. Section B.3 deals with the firm's decisions. Finally, Section B.4 reviews the particular parameterisation used to generate the plots and tables in the paper.

B.1. Incentives to search and work

We assume that all workers retire with probability d each period. A worker who is unemployed is hired with probability h; otherwise, the worker will either retire or be unemployed next period.[19] A current employee faces a probability f of becoming unemployed, a probability

[19] For expositional simplicity, we omit the time subscripts from all endogenous variables. The exogenous variables of our model (the retirement rate d, the unemployment benefit b, the discount factor β, the productivity per worker Λ, and the coefficients a, ϕ, α, and γ) are constants.

d of leaving the labour force permanently and a probability $1 - f - d$ of retaining a job.[20]

Let l_u be the leisure of a worker who is unemployed and $h = h(l_u)$ be that worker's hiring probability, where $h'(l_u) < 0$ because greater leisure when unemployed implies less search for jobs. Furthermore, let $u(b,l_u)$ be the worker's current utility and b his unemployment benefit. Finally, let $V(u)$ be the present value associated with being unemployed, and $V(e)$ be the value of being employed. Then the worker's problem is to make his leisure decision so as to maximise his present value of utility:

$$V(u) = \max_{l_u} \left[u(b, l_u) + \beta\left[h(l_u)V(e) + \left(1 - h(l_u) - d\right)V(u)\right]\right], \tag{B1}$$

where β is the discount factor.

The resulting first-order condition is:

$$u_{l_u} = -\beta\, h'(l_u)\left[V(e) - V(u)\right]. \tag{B2}$$

In other words, the marginal utility of leisure must be set equal to the discounted marginal hiring propensity ($-\beta h'$) times the penalty for not finding a job $(V(e) - V(u))$. Because there is diminishing marginal utility of leisure, the optimal level of leisure depends inversely on the penalty for job loss.

The decision-making problem of an employed worker may be expressed along analogous lines. Let l_e be the leisure of an employed worker and $f = f(l_e)$ be that worker's separation probability, where $f'(l_e)>0$ because more leisure when employed implies less effort on the job and consequently a greater firing probability. Let w be the wage (cost) paid by the firm and t be the tax rate on wage income. Then the employed worker's current utility is $u(w(1-t),l_e)$ and his decision-making problem is to solve:

$$V(e) = \max_{l_e} \left[u(w(1-t), l_e) + \beta\left[f(l_e)V(u) + (1 - f(l_e) - d)V(e)\right]\right]. \tag{B3}$$

[20] One alternative convention for probabilities would be to define them conditional on being alive so that for instance the probability a worker who has been employed stays employed is $(1-f)(1-d)$ instead of $1-f-d$ as in our case.

The associated first-order condition is:

$$u_{l_e} = \beta f'(l_e)\left[V(e) - V(u)\right]. \tag{B4}$$

Here, the marginal utility of leisure must be set equal to the discounted marginal firing propensity ($\beta f'$) times the penalty for job loss ($V(e) - V(u)$). Once again, diminishing marginal utility of leisure implies that the optimal level of leisure depends inversely on the penalty for job loss.

B.2. The workers' decisions

To implement the model, we consider a specific functional form for the workers' utility, hire, and fire functions. We then examine their leisure decisions when unemployed (l_u) and employed (l_e). Each worker faces these hire and fire functions:

$$h(l_u) = \theta\,(1 - a l_u). \tag{B5}$$

$$f(l_e) = \phi\, l_e \tag{B6}$$

where parameters of the hire and fire functions are chosen by the firm (as described below) or determined by technological relations.

Equation (B5) relates the employment probability of an unemployed worker to his leisure; parameters a and θ capture how responsive the employment probability is to decreased leisure (increased search). Equation (B6) relates the separation probability of an employed worker to his leisure: the parameter ϕ captures the effect of increased leisure (decreased effort) on fire rates.

For these hiring and firing functions, we derive the worker's leisure decision when unemployed (l_u) and employed (l_e). Suppose that the unemployed and employed workers have the same instantaneous utility function,

$$u(c,l) = \frac{(c^{\alpha} l^{1-\alpha})^{\gamma}}{\gamma}, \tag{B7}$$

where c is consumption and l is leisure. The worker is assumed to consume all his current income, so that $c = b$ for an unemployed worker (where b is the unemployment benefit) and $c = w(1-t)$ for an employed worker (where $w(1-t)$ is the take-home pay). This assumption may be a reasonable approximation for low-wage workers with welfare-state benefits who have negligible saving and do not have access to capital markets.

Given the utility function (B7), the hire function (B5), and the fire function (B6), the optimality condition (B2) implies that the optimum interior choice of leisure when unemployed is:[21]

$$l_u = \left[\frac{\beta\,\alpha\,\phi}{1-\alpha}\big(V(e)-V(u)\big)\right]^{\frac{1}{(1-\alpha)\gamma-1}} b^{-\frac{\alpha\gamma}{(1-\alpha)\gamma-1}}. \tag{B8}$$

Similarly, the optimality condition (B4) implies that optimum interior choice of leisure when employed is:[22]

$$l_e = \left[\frac{\beta\,\phi}{1-\alpha}\big(V(e)-V(u)\big)\right]^{\frac{1}{(1-\alpha)\gamma-1}} \left[w\,(1-t)\right]^{-\frac{\alpha\gamma}{(1-\alpha)\gamma-1}}. \tag{B9}$$

These first-order conditions are then substituted back into the optimal value equations and a solution for the value function is then derived. This optimal value function is substituted into equations (B8) and (B9) to yield the optimal leisure decisions l_u and l_e. Finally, these optimal leisure decisions are substituted into equations (B5) and (B6) to determine the equilibrium (optimised) hire and fire rates.

B.3. The firms' decisions

The firm maximises profits given by the discrete time Hamiltonian:[23]

$$H = \beta^{t}\left[\Lambda(1-l_e)-w+h_F\,v-T(\theta,h_F)\right]E + \lambda_{+1}E_{+1} \tag{B10}$$

where E is employment, Λ is the productivity of a worker, λ is the shadow value of an extra employee, β is the firm's discount factor[24], $T(\theta, h_F)$ are worker acquisition costs,[25] v is the hiring voucher (a fixed subsidy per person hired), and h_F is the firm's hire rate, which is the

[21] The hire rate in Eq. (B5) must lie between 0 and $1-d$. This implies that: $\frac{1}{a}\left[1-\frac{1-d}{\theta}\right] \le l_u \le \frac{1}{a}$.

[22] The hire rate in Eq. (B9) must lie between 0 and $1-d$ so that $0 \le l_e \le (1-d)/\phi$.

[23] Recall that for expositional purposes, we suppressed the time subscripts from the endogenous variables of our model. So we express a variable one period in the future by subscript +1.

[24] For simplicity, we assume that workers and firms have the same discount factor.

[25] The worker acquisition costs depend on both θ and h to capture the separate effects of training workers hired at rate h and the interview costs associated with a given choice of θ.

number of workers the firm hires divided by its workforce. So, $h_F = h \cdot (U/N)$ where U is aggregate unemployment and N is aggregate employment. The Hamiltonian (B10) is maximised with respect to θ and w, subject to the equation of motion:

$$E_{+1} = (1 + h_F - f - d)E, \tag{B11}$$

We define: $\mu_{+1} = \lambda_{+1}\, \beta^{-t}$ and obtain the first-order conditions with respect to w, θ and μ_t:

$$-\left(1 + \Lambda \frac{\partial l_e}{\partial w}\right) = \mu_{+1} \frac{df}{dw} \qquad \text{(wage equation) (B12)}$$

$$\frac{\partial T}{\partial \theta} = (\mu_{+1} + v) \frac{dh_F}{d\theta} \qquad \text{(hiring equation) (B13)}$$

$$\beta^{-1}\mu = \qquad \text{(value equation) (B14)}$$
$$\left[\Lambda(1 - l_e) - w + h_F v - T(\theta, h_F)\right] + (1 + h_F - f - d)\mu_{+1}$$

The term of df/dw considers the effect of changes in the wage on employed workers' leisure. But as noted, the firm's wage decision is assumed not to affect the leisure decision of the job applicants.

Finally, the stationary state of our labour market system (B11)-(B14) was found numerically.

B.4. Parameterisation of model

We let the period of analysis be one quarter. The parameters we have used are: $\gamma = 0.75$, $\beta = 0.98$, $\alpha = 0.94$, $a = 1.0$, $d = 0$, $\phi = 0.5$, $\Lambda = 1.3$, $t = 0.1$, and $b = 0.4$. We have parameterised worker acquisition costs as $T = \theta^2/2$.

We used the NAG routine E04UCF to calculate the numerical solution to our model, given the parameters above.

The parameters above yield a reasonable approximation of labour market flows in the UK during the early 1990s. For instance, let us define the long-term unemployed to be those unemployed for at least a year (4 periods). If the transition rate out of unemployment is a constant h, then the steady state proportion of people who are unemployed for at least x periods is $(1 - h)^x$. So the fraction of the unemployed who are long-term unemployed is $(1 - h)^4$. During the early 1990s in Britain, roughly 36% of the unemployed have been jobless for over a year: $(1 - h)^4 = 0.36$. This suggests that, under our Markov assumptions, the baseline hire rate should be 0.2254, which is reasonably close to our computed equilibrium hire rate of 0.232.

The wage in our model is 1.16, which implies a replacement ratio of 0.345, which is close to that in the UK. Our separation rate is 0.026, which corresponds to an average job tenure of roughly ten years.

References

Bentolila, S. and J. J. Dolado (1994), Labour Flexibility and Wages: Lessons from Spain, Economic Policy 18, 53-99.

Blinder, A. S. (1987), Hard Head, Soft Hearts, Reading (Addison-Wesley, Mass.).

Buti, M., L.R. Pench and P. Sestito (1998), European Unemployment: Contending Theories and Institutional Complexities, European Commission, mimeo.

Coe, D. and D. J. Snower (1997), Policy Complementarities: The Case for Fundamental Labour Market Reform, International Monetary Fund Staff Papers 44, 1-35.

Daveri, F. and G. Tabellini (1997), Unemployment, Growth and Taxation in Industrial Countries, Brescia University, Discussion Paper No. 9706, Brescia University.

Elmeskov, J., J. P. Martin and S. Scarpetta (1998), Key Lessons for Labour Market Reforms: Evidence from OECD Countries' Experiences, Swedish Economic Policy Review 5, 205-252.

Phelps, E. S. (1994), Structural Slumps (Cambridge, Harvard University Press).

Saint-Paul, G. (1993), On the Political Economy of Labor Market Flexibility, in J. Olivier, (ed.), NBER Macroeconomics Annual 1993 (Cambridge, MIT Press) 151-87.